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PROSPECTIVE TIMBER SUPPLIES and
FOREST INDUSTRIAL DEVELOPMENT
in the WILLAMETTE RIVER BASIN



**ADMINISTRATIVE REPORT prepared for the
Willamette River Basin Task Force of the
COLUMBIA RIVER INTERAGENCY COMMITTEE**

by FOREST SURVEY PROJECT

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
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PROSPECTIVE TIMBER SUPPLIES AND
FOREST INDUSTRIAL DEVELOPMENT

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Administrative Report prepared for the
Willamette River Basin Task Force of the
Columbia River Interagency Committee

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SUMMARY

The Willamette basin's timber resource and output of forest products are a significant part of the Nation's timber economy. An increasing national demand for wood assures that the basin's production will be limited only by the economically available supply of timber. Under this assumption, roundwood consumption will continue to increase to the year 1985. Changes in national demands will result in a changing composition of industry in the basin. These changes, combined with increased labor productivity, will result in a decrease and a redistribution of employment in the basin. The value added by the manufacturing of forest products will increase, due to the shift in industry. Most of the gain will come from the pulp and paper industry. The forest inventory volume will continue to decline through 1985, and the removal of old-growth timber will result in increasing growth rates. Beyond 1985, continued reduction of the inventory is expected to result in lower total growth and a consequent reduction in timber harvest.

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INTRODUCTION

The purpose of this report is to provide the Forestry Outline Group of the Willamette Basin Task Force with an analysis of the present and projected timber resources and forest industries in the Willamette River basin for use in the interagency Willamette River Basin Comprehensive Study. The report was prepared by the Pacific Northwest Forest and Range Experiment Station under a memorandum of understanding between the U.S. Forest Service, Region 6, and the Station, dated March 3, 1965.

The report is divided into five subject matter areas. First, the present timber resource is described. The basis for this is a special compilation of 1961-62 Forest Survey timber inventories in western Oregon. Second, the present forest industry is examined. The third section presents the projection of the future timber economy, including employment in the basin, a review of national trends in the consumption of timber products, and assumptions underlying the national and basin projections. In the fourth section of the text, changes in the nature of the future timber resource are discussed. In the concluding section of the report, the appendix, detailed tables of the resources and industries are presented.

The Forest Service report, "Timber Trends in the United States" and the more recent report "Prospective Economic Developments Based on the Timber Resources of the Pacific Northwest," which has been prepared for the Bonneville Power Administration but not yet published, are the principal sources which have been used in preparation of this report.

THE PRESENT TIMBER RESOURCE

The Willamette River basin has a total land area of 7,709,000 acres, or 40 percent of western Oregon's 19,202,000 acres. A slightly smaller proportion, 4,963,000 acres, or 33 percent of western Oregon's 15,082,000 acres of commercial forest land is in the basin (table 4, p. 23). The Willamette basin's commercial forest land contains 146,117 million board feet of sawtimber (International 1/4-inch rule); this is 36 percent of the 410,837 million board feet in western Oregon.

Western Oregon is one of the major timber producing areas in the country. It has 20 percent of all softwood timber in the United States and produces almost 25 percent of the Nation's cut of softwood sawtimber. The fact that the Willamette basin is approximately one-third of western Oregon gives evidence of the magnitude and importance of the timber resource of the basin.

Most Commercial Forest Land in Middle Willamette Basin

The Willamette basin has been divided into three areas for the purpose of analysis: the upper Willamette basin, the middle Willamette basin, and the lower Willamette basin.

The upper basin, which is mostly in Lane County, is made up of four subbasins: Coast Fork, Middle Fork, McKenzie, and Long Tom. The commercial forest area of the upper basin is 1,766,000 acres (table 5, p. 24) and is 71 percent of the total land area (2,487,000 acres). This basin has 35 percent of the commercial forest land in the Willamette basin.

The middle Willamette basin is located in Benton, Linn, Marion, Yamhill, Polk, and Clackamas Counties. It contains an area of 1,974,000 acres of commercial forest land out of a total land area of 3,472,700 acres. This basin has 40 percent of the total commercial forest land in the Willamette basin and is divided into the Santiam, Coast Range, and Pudding subbasins.

Of the 1,748,800 acres of land in the lower Willamette basin, 1,223,000 acres are commercial forest land in Multnomah, Clackamas, Washington, and Columbia Counties. The lower Willamette basin is divided into four subbasins: Tualatin, Clackamas, Columbia, and Sandy.

Public and Private Ownership of Commercial Forest Land Almost Equal in Willamette Basin

Public owners of commercial forest land have 2,659,000 acres, or 54 percent of the total. Of these owners, the National Forests are dominant with holdings of 2,102,000 acres (79 percent). Private owners hold 2,304,000 acres of the basin's commercial forest area. In this ownership, farmer and miscellaneous private owners control 1,348,000 acres, or 58 percent. National Forests own the largest area of commercial forest land followed by farmer and miscellaneous private holdings.

Public agencies have the greatest area of commercial forest land in both the upper and lower basins, with National Forests having the largest area (table 5, p. 24). Private holdings are the most important in the middle basin, with farmer and miscellaneous private owners the largest private ownership group.

Sixty-One Percent of Commercial Forest Area in Sawtimber Stands

Even though forest industries came to the Willamette basin many years ago, the sawtimber forest inventory is still substantial today. Of the commercial forest land, 3,042,000 acres (61 percent) are covered with timber stands classed as sawtimber (table 6, p. 25). Seedling and sapling stand-size classes cover the second largest area of commercial forest land in the basin, or 1,195,000 acres (24 percent).

About 3 percent of the area is nonstocked. The upper basin has slightly more area in the sawtimber and poletimber categories than the other basins.

Sixty-Two Percent of Commercial Forest Area Well Stocked

The greatest part of the commercial forest land in the Willamette basin is well stocked; 3,088,000 acres have a stocking class of 70 percent and above (table 7, p. 26). About 1 million acres are in the 40- to 70-percent stocking class, while 734,000 acres are in the 10- to 40-percent stocking class. In both the upper and lower basins, 69 percent of the commercial forest land has a stocking class of 70 percent or greater, while the middle basin has only 51 percent in this class.

In general, the public lands in the Willamette basin are well stocked. About 90 percent of the National Forest lands and 70 percent of other public lands are in this category. Forest industry and farmer and miscellaneous private owners generally have commercial forests which are not as well stocked. Over most of the basin, between 60 and 70 percent of the private land is less than 70 percent stocked.

Softwood Sawtimber Volume Greatest in Upper Basin

The Willamette basin has 142,209 million board feet of softwood sawtimber. Timber volumes are concentrated in the more mountainous headwater area of the basin. The upper Willamette basin has 43 percent of the total softwood sawtimber volume; the middle, 34 percent; and the lower, 23 percent.

The timber is also larger in the upper basin, which has 35 percent of its softwood sawtimber volume in trees 39.0 inches d.b.h. and larger. In the middle basin, 30 percent of the softwood sawtimber is in trees of this size class, while the proportion in the lower basin decreases to 23 percent.

Douglas-fir is the most important softwood sawtimber species, making up about 69 percent of the total softwood sawtimber inventory. Western hemlock is next in importance and comprises about 15 percent of the total softwood sawtimber volume. Although Douglas-fir is the dominant species in all the basins, it becomes a smaller part of the total forest inventory in the transition from the upper to the lower basin. As the proportion of Douglas-fir decreases, hemlock increases. Douglas-fir is 72 percent of the softwood sawtimber inventory in the upper basin, 71 percent in the middle basin, and 61 percent in the lower basin. In the upper basin, hemlock is 9 percent of the total softwood sawtimber volume; this increases to 20 percent in both the remaining basins (tables 8-14, pp. 27-33).

Hardwood Sawtimber Minor

The hardwood sawtimber volume in the basin totals 3.9 billion board feet, with red alder the most abundant species. Oregon white oak and Oregon ash are the other principal hardwoods and are currently in little demand. Hardwood volume is concentrated in the middle basin (56 percent), with lesser amounts in the lower and upper basins, 24 and 20 percent, respectively. Most of the hardwoods are in farmer and miscellaneous private ownership (66 percent). The remaining owner-ships have approximately equal volumes (10 to 13 percent). Hardwood sawtimber is relatively small with 65 percent of the volume in the 11- to 18.9-inch d.b.h. class, 25 percent from 19.0 to 28.9 inches d.b.h., with the remaining volume mainly in the 29.0- to 38.9-inch d.b.h. class (tables 8-14).

Most of Softwood Sawtimber Volume in National Forests

National Forests in the Willamette River basin have 95.5 billion board feet (International 1/4-inch rule), or 67 percent of the basin's softwood sawtimber (table 15, p. 34). Other public commercial forest land supports 13 percent of the softwood sawtimber. Forest industry owns 12 percent, and farmers and miscellaneous private owners hold about 8 percent of the softwood sawtimber.

In the lower basin, the National Forests have 84 percent of the 33.1 billion board feet of softwood sawtimber, and other public has 5 percent (table 20, p. 39). In the private sector, farmers and miscellaneous private owners hold 8 percent of the total, while forest industry has only 3 percent.

In the upper Willamette basin, the National Forests own 49.5 billion board feet of softwood sawtimber, which is 81 percent of the total. Other public owners hold 10 percent of the softwood sawtimber, while forest industry owns 8 percent. Miscellaneous private owners account for very little of the softwood sawtimber volume (table 16, p. 35).

The middle Willamette basin's softwood sawtimber is more evenly distributed among the various owner groups than is the case in the upper or lower basins. However, the National Forest is still the largest single owner with 18.1 billion board feet of softwood sawtimber, or 38 percent of the total (table 18, p. 37). Other public owners hold 23 percent; forest industry, 24 percent; and farmers and miscellaneous private, 15 percent.

THE PRESENT FOREST INDUSTRY

The present forest industry is described here in terms of log production, timber products output, and employment. Log production data are based on compilations by the Pacific Northwest Forest and Range

Experiment Station. Timber products output data are derived from various sources, including the Bureau of the Census and forest industry. Employment figures are from the Oregon Department of Employment. Limitations on source data permit reporting by county but not by basin. This does not create serious biases as most of the basin and subbasins are reasonably well delineated by county lines.

Log Production Stable Since 1950

Log production in western Oregon has increased substantially since the 1920's. In 1925, 3 billion board feet (International 1/4-inch rule) of logs were harvested in Oregon. During the depression, demand for timber declined and log production in western Oregon dropped to a low of 1.3 billion board feet in 1932. As the economy recovered, the demand for timber products increased. Western Oregon's log production began an increasing trend, which reached a peak in 1952 when the timber harvest was 10.4 billion board feet. Since the recorded high of 1952, production has leveled off and remained relatively stable. Most of the recent fluctuations in the timber harvest appear to be largely the result of business cycles.

The Willamette basin's historical log production has, in general, followed the pattern found in western Oregon, and here, too, recent log production has leveled off. In 1950, log production in the basin amounted to 3.8 billion board feet (International 1/4-inch rule), or 45 percent of western Oregon production (table 23, p. 42). In 1963, it was 3.7 billion board feet, or 44 percent of the production in western Oregon.

Although total log production has remained relatively stable in the past 14 years, there have been substantial internal shifts in the suppliers of the logs which were harvested. In 1950, public owners supplied 24 percent of the log production, while in 1963 they accounted for 56 percent. Production from public lands since 1950 has increased 133 percent, while private production has decreased 43 percent.

The greatest absolute increase in total production from public lands came from National Forests, whose 1963 production was 920,820,000 board feet greater than in 1950, an increase of 160 percent. The Bureau of Land Management had the greatest relative increase, with 1963 production 189 percent greater than in 1950. The harvest from the State of Oregon land in the Willamette basin in 1963 was down 56 percent from the 1950 harvest; most of this reduction can be attributed to completion of salvage logging in the Tillamook burn in the early part of the 1950's.

The Output of Timber Products, 1963

Production of forest products from the Willamette basin (table 24, p. 45) is of sufficient magnitude to be nationally significant. Veneer and plywood, lumber, and woodpulp are the basin's most important forest products.

The Willamette basin produced 34 percent of the Nation's softwood veneer and plywood, or 3,514 million square feet (3/8-inch); most of this was manufactured in Lane and Linn Counties.^{1/}

Nine percent of the Nation's 1963 lumber production was manufactured in the basin. As shown in table 24 (p. 45), the basin's 1963 lumber production amounted to 3,109 million board feet, with Lane County producing almost 40 percent of the total output. The basin produced slightly more than half of western Oregon's total production of 5,844,686,000 board feet (Western Wood Products Assoc. 1963, p. 3).

In 1963, the Willamette basin produced 874,000 short tons of woodpulp, which represent 3 percent of the Nation's production. It produced 71 percent of Oregon's woodpulp, with the major share being contributed by Clackamas, Columbia, and Linn Counties.

The particle board industry is still developing and is located in only two counties in the basin: Lane and Linn. Firms in these counties manufactured 81,400 million square feet (3/4-inch basis) of particle board out of the total 123,129 million produced in Oregon.

Lane, Linn, and Clackamas Counties produced most of the miscellaneous wood products. The basin in 1963 produced 16,848,000 cubic feet of these products out of a total of 38,269,000 cubic feet for western Oregon.

Plants and Employment, 1963

In this section on plants and employment, forest employers have been grouped into four major categories: lumber and wood products,^{2/} veneer and plywood, paper and allied products, and logging.

^{1/} Based on an allocation of the Bureau of the Census production data for Oregon, on the basis of installed plant capacity.

^{2/} Includes all Standard Industry Classification categories under code 24, except 2411 and 2432.

There were 456 lumber and wood products plants in the Willamette basin in 1963, which employed 14,433 workers. Veneer and plywood plants, although numbering only 82, had 12,835 employees. Forty-nine paper and allied products plants had 6,372 employees. Logging employed 5,535 workers. In total, all wood products firms in the basin employed 39,175 people in 1963 (table 25, p. 46).

There were 14,218 employees in the upper basin's forest industries, 11,693 in the middle basin, and 13,264 in the lower basin. Although there is not a great difference among basins in total employment, there is considerable difference in employment by industry group. These differences are especially noticeable between the lower basin and the upper and middle basins. The distribution of workers into the various industry groups within each basin is shown in table 1 (p. 8).

Thirty-six percent of the employees in the lower basin work in the paper and allied products industry group as contrasted to the middle and lower basins, where 10 and 3 percent are so employed. The resource-oriented upper and middle basins have 16 to 17 percent of their employees working in logging, while the lower basin has only 9 percent in this category.

The mutual need for easy exchange of logs, in order to assure that the highest values are realized from the mix of logs when timber is harvested, tends to draw sawmills and veneer and plywood mills into close association. The high percentage of sawmills in the upper and middle basins is thus related to the high percentage of veneer and plywood mills in these two basins. As a result, both the middle and upper basins have a substantially greater proportion of employees in sawmills and veneer and plywood plants than the lower basin.

Lower Basin Most Important in Value Added by Manufacturing

Employment provides one measure of the benefits from forest industry. Another measure frequently used to reflect economic benefit to a community from its manufacturing base is "value added by manufacture." Value added by manufacturing of timber products is, in general, the net increase in product value added by the manufacturing process.^{3/} In the following tabulation based on the 1958 Census of Manufacturing for Oregon, the estimated value added by manufacturing per employee for principal industries is shown:

^{3/} See formal definition, appendix, p. 67.

Table 1.--Distribution of employees within subbasins
by industry group, 1963

Subbasins	Logging	Lumber and wood products	Veneer and plywood	Paper and allied products	
- - - - - <u>Percent of subbasin employment</u> - - - - -					
Upper basin	17	38	<u>1</u> /(30)	42	3
Middle basin	16	36	<u>1</u> /(31)	38	10
Lower basin	9	37	<u>1</u> /(17)	18	36

1/ Sawmills only.

Paper and allied products	\$14,757
Veneer and plywood	8,798
Lumber and wood products ^{1/}	7,957

^{1/} Includes all SIC codes 24, except that for veneer and plywood.

In the Willamette basin, the total value added by the manufacture of forest products was \$366 million (1958 dollars) in 1963. The forest industries of the lower basin produced 38 percent (\$140 million) of this total; the upper basin, \$120 million (33 percent); and the middle basin, only \$105 million (29 percent). The paper and allied products industry contributed over half of the value added in the lower basin, while the lumber and wood products industry accounted for most of the value added in the upper and middle basins.

FUTURE ECONOMY

In this section of the report, estimates of future levels of timber production and anticipated product mix are made for the Willamette River basin. The principal markets for the basin's timber products lie outside the State and are distributed over the Nation. Therefore, the future production in the basin will be strongly influenced by the national demand for timber products. The projected national demand is examined in the recent Forest Service report, "Timber Trends in the United States." National estimates of demand are then related to regional estimates of supply as developed in the report, "Prospective Economic Developments Based on the Timber Resources of the Pacific Northwest."^{4/} On the basis of these reports, the Willamette basin's future production is developed.

Assumptions Underlying National Projections

Because of the importance of national demands to the basin, it is necessary to know the assumptions underlying the national projections. These projections were based on consideration of five principal factors. These included population, household formation, gross national product, disposable personal income, and construction activity.^{5/}

^{4/} U.S. Forest Service. Prospective economic developments based on the timber resources of the Pacific Northwest. 1965. Preliminary draft, specially prepared for the Bonneville Power Administration, under cooperative agreement as a part of the "Pacific Northwest Economic Base Study for Power Markets, 1965."

^{5/} Only highlights are presented here; for additional detail, the two reports referred to in the previous paragraph should be reviewed.

Population.--By 1985, population of the United States is expected to rise to about 260 million persons and to 325 million by the year 2000. The projection approximates the median of a series of projections published by the U.S. Bureau of the Census (1964) and is roughly 10 percent lower than that of the preceding series prepared in 1960 for the Senate Select Committee on Water Resources.

Households.--Households in the United States have been projected to increase from 54.7 million in 1962 to 101 million in 2000 (table 34, p. 55). The number of persons per household is expected to continue to decline, from 3.41 in 1962 to 3.22 in 2000.

Gross national product.--Based on an increased population, recent trends in productivity and other factors, the gross national product is projected to increase 2.2 times, to \$1,175 billion (1961 dollars) by 1985, and will continue to rise to \$1,920 billion by the year 2000.

Disposable personal income.--Disposable personal income in 1962 was \$379 billion (1961 dollars), is expected to rise to \$960 billion in 1990, and to \$1,340 billion in 2000 (fig. 1, p. 10a). Disposable personal income per capita is expected to more than double between 1962 and the year 2000, rising from \$2,030 to \$4,120 (1961 dollars) (table 34, p. 55).

Construction activity.--Past trends in use and statistical analysis of historical relationships indicate that the use of industrial raw materials will rise about 1.5 times by the year 1985. Four-fifths of the annual consumption of lumber and plywood, nearly all of the poles and piling, and substantial quantities of other industrial timber products are used for construction activity in the United States. Construction expenditures are expected to double by 1985, and the consumption of construction materials is expected to increase 55 percent during the same period. It was assumed that the relative price of timber products and competing materials would remain stable, and therefore industrial timber products would maintain their relative position in the mix of industrial materials--about 22 percent.

Increase Expected in National Demand for Timber Products

From these basic assumptions, demands for timber products have been projected to 1985 for the United States as shown in table 35 (p. 57). The total demand for lumber is expected to rise from 37.3 billion board feet in 1962 to 45.5 billion board feet in 1985, an increase of 22 percent for the 23-year period. Even though total demand is increasing, lumber demand per capita is expected to decline to 175 board feet.

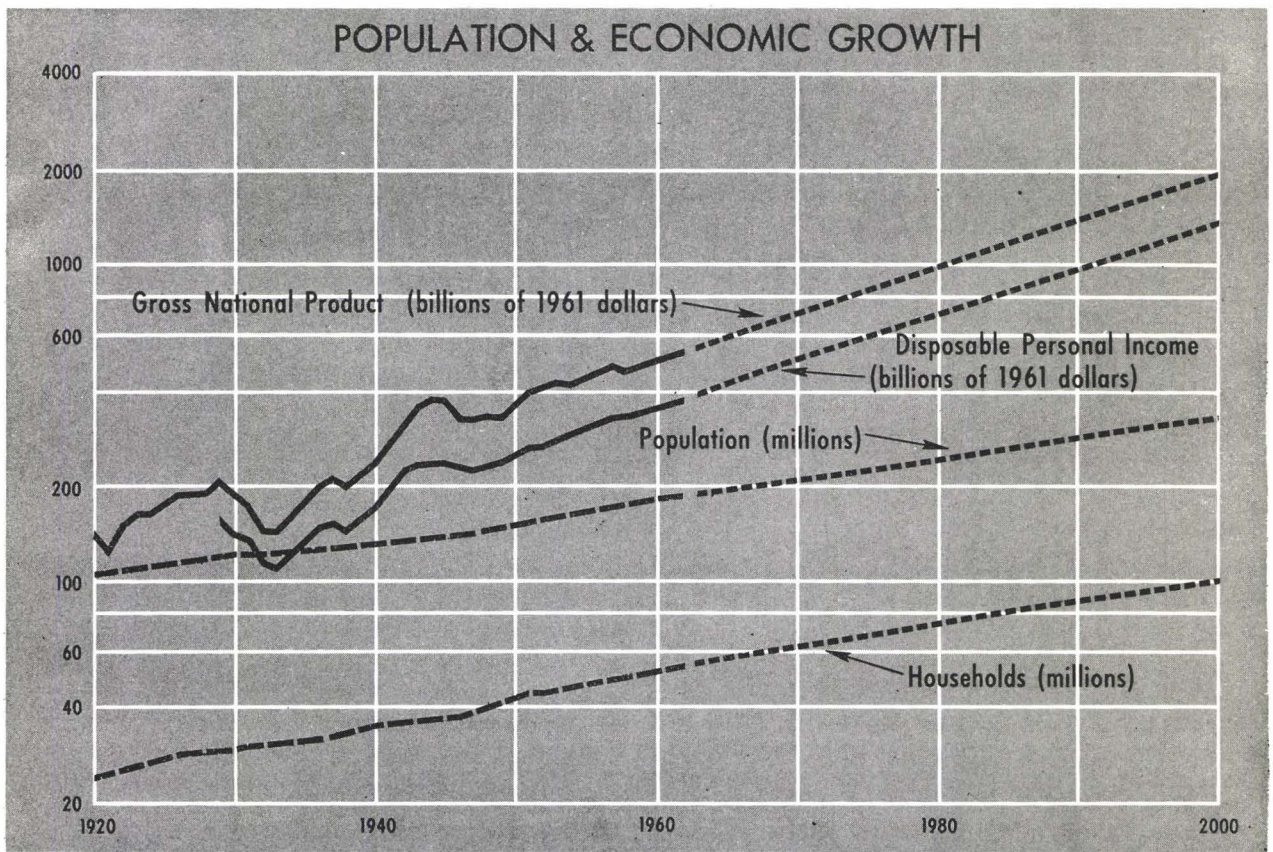


Figure 1.--Population and economic growth in the United States, 1920-2000.
Source: Timber Trends in the United States, p. 6.

Plywood and veneer demand should double by 1985 to 24.2 billion square feet (3/8-inch basis). In 1962, 77 percent of the plywood and veneer was softwood; in the next few decades, softwoods will maintain this percentage of total demand. Historically, most of the softwood veneer and plywood products have come from the west coast, but the South can be expected to supply an increasing share of the demand in the future.

Unlike lumber, plywood's demand per capita is increasing and is expected to reach 93 square feet (3/8-inch basis) by the year 1985. Demand for woodpulp should double, while that for paper and board should nearly double during the same period. Paper and board demand per capita should rise to 609 pounds in 1985. Although the domestic forests are expected to meet most of the increase in future demand, net imports of lumber, veneer logs, and pulpwood are nevertheless expected to increase in the future--a source of competition in domestic markets.

In 1985, domestic lumber production is projected to be 39.4 billion board feet (International 1/4-inch rule). Domestic plywood and veneer production, in terms of log requirements, is projected to be 11.6 billion board feet. Domestic pulpwood production will be about 88 percent of the pulpwood consumption equivalent at the end of the 23-year projection period (table 36, p. 58). The projections indicate that the consumption of minor industrial products will remain about the same, while the consumption of fuelwood is expected to decline.

Additional Assumptions Applicable to Willamette River Basin

In addition to the previous assumptions additional assumptions regarding trends in forest management, allowable and prospective cuts from public and private lands, land use, and productivity rates were made for the regional analysis, "Prospective Economic Developments Based on the Timber Resources of the Pacific Northwest." These apply also to the Willamette River basin.

Trends in forest management.--It was assumed that trend of an increasing level of forest management including protection, reforestation, utilization, and intermediate timber harvests would continue.

Allowable cuts from public lands.--The estimates of future cuts from public lands--National Forests, State, and Bureau of Land Management--are planned levels of cut based on each agency's estimates of future conditions. They generally take into account expectations of an increased intensity of management on the lands under their control.

Prospective cut from private lands.--This was estimated as the level of cut likely to occur under an extension of past levels of production into the future as modified by changes in the relationship between timber growth and inventory.

Land use.--It was assumed that there would be no substantial change in the amount of commercial forest land available for timber production.

Future Willamette Basin Production Limited by Supply

Both the national report, "Timber Trends in the United States," and the report, "Prospective Economic Developments Based on the Timber Resources of the Pacific Northwest," point out that a substantial share of the future national demand for timber will be for the kind of large, high quality softwood timber found in western Oregon and the Willamette basin. Only a small part of the output of forest products in western Oregon or the Willamette River basin is consumed locally, allowing the bulk of it to go to national markets. This trend will continue in the future, for the forest products industry is highly developed and well diversified. It also has a large proportion of forest lands under a relatively high level of forest management. Because of these advantages, it is assumed that all of the economically available supply of timber in the basin will be readily absorbed by the growing demands of the Nation. Thus, the key to the future forest economy in the basin is the available supply of timber.

The projections of future available timber supply are based on the planned allowable cuts on public lands and on the trends of past cutting on private lands. Future harvests are modified by the effects of such cutting on growth and inventory. The estimate of total available volume includes live, sound trees, and the usable portions of cull and dead trees. Log movements in the Pacific Northwest are included in the projection as well as net log exports. These projected volumes then represent the total volume of roundwood available for consumption by the forest industries.

Future Consumption

Use of saw logs for lumber in western Oregon is expected to decline from 5.8 to 3.7 billion board feet between 1962 and 1985. Veneer log use is expected to rise from 3.2 billion board feet to 5.4 billion board feet. Roundwood pulpwood use from sawtimber is projected to nearly double by 1985--rising from 71 million cubic feet

to 130 million cubic feet, excluding residues and poletimber.^{6/} These estimates were allocated to the Willamette basin on the basis of the proportion of 1963 installed mill capacities. This same proportion was kept throughout the projection period.

Total Roundwood Consumption
to Increase 8 Percent by 1985

Table 26 (p. 47) shows estimated consumption of roundwood for timber products from 1965 through 1985, by 5-year periods, in the Willamette River basin by basin area. The consumption of sawtimber in 1965 is estimated at 5.3 billion board feet and is anticipated to increase to 5.7 billion board feet in 1985. In terms of million cubic feet, 1965 consumption will be 825; and in 1985, it will be 888 million cubic feet, an increase of 8 percent.

Saw-Log Consumption to Decline

Even though total saw-log consumption in the U.S. is expected to increase, the projected trend in saw-log consumption in the Pacific Northwest and in the Willamette basin is expected to decrease. Table 27 (page 48) shows the estimated consumption by 5-year periods, 1965-85, in the Willamette River basin by basin area. In 1965, it is estimated that 2,529 million board feet of saw logs will be consumed in the basin; by 1985, the consumption is expected to fall to 1,871 million board feet--a decrease of 26 percent.

Consumption of Veneer Logs to
Increase Less Than National Average

National veneer log consumption is expected to double by 1985. Softwood veneer log consumption in the Pacific Northwest is not expected to grow quite as rapidly as national demand because of the development of the softwood plywood and veneer industry in the South.

Table 28 shows that the estimated Willamette basin veneer log consumption will increase 33 percent between 1965 and 1985. Consumption is expected to be 2,247 million board feet in 1965, and 2,987 million board feet in 1985.

^{6/} Op. cit.

Consumption of Pulpwood to
Increase 1.8 Times by 1985

The Pacific Northwest's increase in pulpwood consumption is expected to be slightly higher than the national average. Integration of pulpmills with sawmills and veneer mills and the use of residues have led to low costs per unit of wood. The supply of residues will tend to become tighter during the projection period, but will be sufficient to meet anticipated requirements.

Estimated total consumption of pulpwood in the Willamette basin will increase from 142 million cubic feet in 1965 to 259 million cubic feet in 1985--an increase of 82 percent (table 29, p. 50). The consumption of round pulpwood in the basin is estimated to be 53 million cubic feet (table 30, p. 51) in 1965, and pulpwood chips, 89 million cubic feet (table 31, p. 52). By 1985, round pulpwood consumption will be increased to 99 million cubic feet and chips to 160 million cubic feet.

Small Increase Projected in
Miscellaneous Wood Products

Projections for the Nation show that little increase is expected in the consumption of miscellaneous wood products such as poles, pilings, fenceposts, and fuelwood. The Pacific Northwest's projection also includes log exports as miscellaneous wood products. A small increase is expected for the Pacific Northwest. Miscellaneous wood products consumption in the Willamette River basin will increase from 32 million cubic feet in 1965 to 36 million cubic feet in 1985 (table 32, p. 53).

Total Forest Employment
to Decrease

Employment has been projected to 1985 for the Willamette basin by industry groups. These include (1) lumber and wood products; (2) plywood and veneer; (3) pulp, paper and allied products; and (4) logging. Estimates of employment used in this report include only workers whose employment was recorded by the Oregon State employment agency.

Recent trends in total forest industry employment have been down. Table 33 (p. 54) shows that in the Willamette basin the average annual employment for the forest industry will decrease 9 percent from 40,900 in 1965 to 37,400 in 1985. Lumber and wood products will decrease for the period from 13,600 to 9,700, or 29 percent.

Veneer and plywood will decrease 6 percent, while logging will decrease 11 percent in the basin. Only in the pulp and paper industry will employment increase. In 1965, pulp and paper employed 6,700 persons; and in 1985, 8,600 will be employed--an increase of 28 percent.

Productivity of workers in the forest industry has increased due to automation and mechanization. The effect of this increase has been to reduce employment per unit of production. It is expected that the productivity trends of the past will continue into the future, although at a greatly reduced rate. This report does not account for secondary employment resulting from automation and mechanization, such as people who service the machines used in the forest industry.

Distribution of Employees in Willamette Basin to Change

In making the projection of future employment, it was assumed that the relative distribution of industry groups among basins will remain constant during the projection period. Thus, the distribution of employment by industry group does not change; for example, the lower basin will continue to have 76 percent of those employed in pulp and paper; the middle basin, 19 percent; and the upper basin, 5 percent.

However, the distribution of employees within each basin will change. All three basins will have a decrease in the proportion of workers in the sawmill industry. All three basins will have increases in the proportion of workers employed in the veneer and plywood industry, with the greatest increase in the upper basin. Employment will increase in the paper and allied products industries in both the middle and lower basins, with the principal increase in the lower basin.

The lower basin will still be the most important segment of the Willamette River basin's forest economy in 1985. This basin will have an increase in the proportion of workers in the paper and allied products industry (table 2, p. 16), and it will have the greatest number of forest products employees in the whole basin (table 33, p. 54). Because of the high proportion of workers in the paper industry (49 percent), it will be important not only for its sheer number of employees, but also for its high value added to the economy per employee.

Table 2.--Distribution of employees within basins

by industry group, 1963 and 1985

(In percent)

Industry group	Upper basin		Middle basin		Lower basin	
	1963	1985	1963	1985	1963	1985
Logging	17	17	16	15	9	8
Lumber and wood products	38	28	36	25	37	24
Veneer and plywood	42	52	38	45	18	19
Paper and allied products	3	3	10	15	36	49

Value Added by Manufacturing
to Remain Stable

The value added by the manufacture of forest products in the Willamette basin is expected to increase from 366 million dollars (1958 dollars) in 1963 to only \$368 million in 1985. Although value from the forest industry will be essentially stable, the anticipated divergent trends within the industry are masked by these figures. Increases in value added by the pulp and paper and the veneer and plywood industries are expected to offset the decreases in logging and the lumber and wood products industry.

The lower basin is the only one to show a net increase in the value added by manufacturing. Here, a substantial increase in the pulp and paper industry, plus a relatively small increase in output of veneer and plywood, produces a net gain of \$14 million, from \$140 million in 1963 to \$154 million in 1985. Both the middle and upper basins show a net decrease in the production of manufacturing values. In the middle basin, the decrease is small--from \$105 million in 1963 to \$103 million in 1985. In the upper basin, the decrease is considerably greater--from \$120 million in 1963 to \$111 million in 1985. In both of these basins, increases in value added by the manufacture of pulp and paper and of veneer and plywood are not sufficient to offset the expected decreases of logging and lumber and wood products manufacturing.

FUTURE TIMBER RESOURCE

Inventory to Change Substantially

During the period 1963 to 1985, inventories of sawtimber in the Willamette basin will decline 26 percent. In 1985, the sawtimber inventory is expected to be 108,360 million board feet (International 1/4-inch rule). It was estimated to be 146,117 million board feet in 1963. The following tabulation shows the change in inventory volume on commercial forest land in the Willamette River basin:

<u>Owner</u>	<u>1963</u> (MMBF, Internat'l. 1/4-inch rule)	<u>1985</u>	<u>Change</u> (Percent)
National Forest	95,849	75,721	-21
Other public	18,943	15,723	-17
Private	<u>31,325</u>	<u>16,916</u>	<u>-46</u>
	146,117	108,360	-26

Most of the reduction will take place with the systematic removal of the large, mature, and overmature timber. By 1985, the National Forest and other public owners' inventories of sawtimber will be reduced by 21 and 17 percent, respectively. Private owners will have reduced their inventory 46 percent by 1985, according to the present projection. This trend is expected to continue; by the year 2020, the total inventory volume will be only 50 percent of the 1963 inventory volume.

A consequence, which will be realized as the inventory changes, is that there will be an increasing proportion of growing-stock volume in the small diameter classes. This can be seen in table 3 (p. 19) by comparing the changes in the 6- to 18-inch diameter classes. The National Forests' ratio of volume in these trees to the total inventory is expected to increase from 24 percent in 1963 to 29 percent in 1985. The other public lands are expected to show an increase from 26 percent to 47 percent during that period. Due to the heavy cut anticipated on private lands, the ratio will increase from 34 percent in 1963 to 68 percent in 1985.

In the Willamette basin net annual growth of sawtimber increased on all ownerships. The greatest increase occurred on National Forest lands, with smaller increases on other public and private lands as follows:

<u>Owner</u>	<u>1963</u> (MMBF, Internatl. 1/4-inch rule)	<u>1985</u>	<u>Change</u> (Percent)
National Forest	172	320	+86
Other public	168	258	+54
Private	408	480	+18

The large increases in growth rates on public lands are associated with the reduction of inventory in old-growth stands and the substitution of faster growing young trees. On the private lands, the increment in growth is less than on public lands, due to the low stocking level of the projected inventory.

A further look ahead to the year 2000 shows that after 1990 the long trend of increasing growth, a pattern since 1963, stops. Growth begins to decrease. Between 1963 and 1990, growth in the Willamette basin will increase 354 million board feet--an average annual gain of 13 million board feet a year. But between 1990 and 2000, growth will decrease 19 million board feet, or almost 2 million board feet a year (table 22, p. 41).

Table 3.--Distribution of western Oregon growing stock
volume by diameter and owner classes, 1963 and 1985

(In percent)

Diameter classes by 2-inch classes	National Forest		Private		Other public	
	1963	1985	1963	1985	1963	1985
6-10	6	8	11	25	7	13
12-18	18	21	23	43	19	34
20-28	25	26	21	20	24	32
30-38	22	20	16	5	20	13
40-48	16	13	13	2	13	3
50-58	8	7	8	2	9	2
60+	5	5	8	3	8	3
Total	100	100	100	100	100	100

The projected decline in net annual growth will occur on private land and will be due mainly to the reduction of inventory to the point where growth cannot be maintained.^{7/} In anticipating future trends to the year 2020, it is assumed that the cut on private land will be reduced in order to rebuild the inventory. As a result, the downward trend in net annual growth after 2000 on private lands will level off or even start to increase. However, the influence of the lowered private cut will result in a lowering of the total future cut in the basin. It is estimated that in the year 2020, the total cut will be only 82 percent of the 1963 log harvest.

^{7/} Growth in inventory and cut by ownership in western Oregon is shown in figure 1 of "Prospective Economic Developments Based on the Timber Resources of the Pacific Northwest."

Table 4.--Land area of the Willamette River basin by

subbasin and land class

(In thousand acres)

Subbasin	Total land area ^{1/}	Total forest land area	Forest land ^{2/}		
			Commercial	Unproductive	Productive reserved
Upper basin	2,487	1,949	1,766	64	119
Middle basin	3,473	2,085	1,974	42	69
Lower basin	1,749	1,238	1,223	13	2
Total	7,709	5,272	4,963	119	190

^{1/} Estimate of total land area provided by Corps of Engineers.

^{2/} Estimates of forest land area developed from Forest Survey and National Forest Timber Management Planning inventories.

Table 5.--Area of commercial forest land in the Willamette River basinby subbasin and ownership class, 1963

(Thousands of acres)

Subbasin	Ownership class					
	Total	National Forest	Bureau of Land Management	Other public	Forest industry	Farmer owned and misc. private
Upper basin:						
Coast Fork	379	85	81	--	162	51
Middle Fork	760	628	20	--	77	35
McKenzie	481	336	27	--	84	34
Long Tom	146	--	20	7	33	86
Total	1,766	1,049	148	7	356	206
Middle basin:						
Santiam	1,065	375	86	52	235	317
Coast Range	602	23	63	15	184	317
Pudding	307	--	62	7	117	121
Total	1,974	398	211	74	536	755
Lower basin:						
Tualatin	229	--	--	68	8	153
Clackamas	561	423	10	--	13	115
Columbia	97	--	11	--	36	50
Sandy	336	232	14	14	7	69
Total	1,223	655	35	82	64	387
All subbasins	4,963	2,102	394	163	956	1,348

Table 6 .--Area of commercial forest land in the Willamette River
basin by subbasin and stand-size class, 1963

(Thousands of acres)

Subbasin	Stand-size class				
	Total	Sawtimber	Poletimber	Seedlings and saplings	Nonstocked
Upper basin:					
Coast Fork	379	193	44	133	9
Middle Fork	760	614	39	88	19
McKenzie	481	329	68	81	3
Long Tom	146	48	22	67	9
Total	1,766	1,184	173	369	40
Middle basin:					
Santiam	1,065	698	84	254	29
Coast Range	602	283	49	262	8
Pudding	307	164	14	122	7
Total	1,974	1,145	147	638	44
Lower basin:					
Tualatin	229	69	77	76	7
Clackamas	561	388	97	47	29
Columbia	97	57	26	14	--
Sandy	336	199	69	51	17
Total	1,223	713	269	188	53
All subbasins	4,963	3,042	589	1,195	137

Table 7.--Area of commercial forest land in the Willamette River
basin by basin area, owner, and stocking class, 1963

(Thousands of acres)

Basin area and owner class	Stocking class				
	Total	70 percent plus	40-70 percent	10-40 percent	Less than 10 percent
Upper basin:					
National Forest	1,049	932	67	49	1
Other public	155	108	34	13	--
Forest industry	356	146	62	117	31
Farmer and misc. private	206	43	94	61	8
Total	1,766	1,229	257	240	40
Middle basin:					
National Forest	398	361	20	10	7
Other public	285	206	40	32	7
Forest industry	536	206	174	134	22
Farmer and misc. private	755	241	335	171	8
Total	1,974	1,014	569	347	44
Lower basin:					
National Forest	655	592	28	23	12
Other public	117	80	23	7	7
Forest industry	64	21	22	14	7
Farmer and misc. private	387	152	105	103	27
Total	1,223	845	178	147	53
All subbasins and owner classes	4,963	3,088	1,004	734	137

Table 8.--Volume of growing stock and sawtimber on commercial forest land
in the Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)				
	Total	Diameter class (inches)					Total	Diameter class (inches)			
		5.0-10.9	11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger		11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger
- - - - - <u>Million cubic feet</u> - - - - - <u>Million board feet</u> - - - - -											
Softwoods:											
Douglas-fir	15,889	1,077	2,968	3,723	3,257	4,864	98,625	13,703	22,774	24,071	38,077
Western hemlock	3,721	360	985	1,194	832	350	22,096	5,462	8,053	6,004	2,577
True firs	2,274	450	694	640	312	178	10,252	3,065	3,820	2,046	1,321
Sitka spruce	4	--	--	1	3	--	19	1	1	16	1
Other softwoods	2,354	333	722	727	366	206	11,217	3,343	4,288	2,275	1,311
Total	24,242	2,220	5,369	6,285	4,770	5,598	142,209	25,574	38,936	34,412	43,287
Hardwoods:											
Red alder	430	175	219	28	8	--	1,404	1,109	211	80	4
Other hardwoods	848	478	233	97	33	7	2,504	1,445	744	259	56
Total	1,278	653	452	125	41	7	3,908	2,554	955	339	60
All species	25,520	2,873	5,821	6,410	4,811	5,605	146,117	28,128	39,891	34,751	43,347

Table 9.--Volume of growing stock and sawtimber on commercial forest land in the upper Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)				
	Total	Diameter class (inches)					Total	Diameter class (inches)			
		5.0-10.9	11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger		11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger
- - - - - <u>Million cubic feet</u> - - - - - <u>Million board feet</u> - - - - -											
Softwoods:											
Douglas-fir	6,856	314	1,088	1,592	1,390	2,472	44,218	4,668	9,195	10,734	19,621
Western hemlock	982	128	291	299	197	67	5,704	1,654	2,098	1,470	482
True firs	1,102	239	355	278	143	87	4,668	1,408	1,657	943	660
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	1,385	178	406	441	247	113	6,434	1,799	2,510	1,482	643
Total	10,325	859	2,140	2,610	1,977	2,739	61,024	9,529	15,460	14,629	21,406
Hardwoods:											
Red alder	51	19	24	5	3	--	213	104	59	46	4
Other hardwoods	165	76	52	25	10	2	555	251	196	90	18
Total	216	95	76	30	13	2	768	355	255	136	22
All species	10,541	954	2,216	2,640	1,990	2,741	61,792	9,884	15,715	14,765	21,428

Table 10.--Volume of growing stock and sawtimber on commercial forest land in the subbasins
of the upper Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)				
	Total	Diameter class (inches)					Total	Diameter class (inches)			
		5.0- 10.9	11.0- 18.9	19.0- 28.9	29.0- 38.9	39.0 and larger		11.0- 18.9	19.0- 28.9	29.0- 38.9	39.0 and larger
----- Million cubic feet ----- Million board feet -----											
COAST FORK											
Softwoods:											
Douglas fir	1,390	75	305	304	229	477	9,475	924	1,235	2,708	4,608
Western hemlock	111	23	36	37	10	5	849	284	381	150	34
True firs	101	3	73	14	11	--	82	37	22	23	--
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	176	8	73	37	25	33	706	233	176	137	160
Total	1,778	109	487	392	275	515	11,112	1,478	1,814	3,018	4,802
Hardwoods:											
Red alder	14	6	7	1	--	--	66	14	31	17	4
Other hardwoods	41	26	10	5	--	--	76	36	36	3	1
Total	55	32	17	6	--	--	142	50	67	20	5
All species	1,833	141	504	398	275	515	11,254	1,528	1,881	3,038	4,807
MIDDLE FORK											
Softwoods:											
Douglas-fir	3,111	101	377	613	671	1,349	20,677	1,801	3,825	4,720	10,331
Western hemlock	588	66	181	175	123	43	3,268	969	1,136	852	311
True firs	583	102	187	172	82	40	2,877	912	1,072	579	314
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	878	83	240	316	173	66	4,356	1,120	1,797	1,036	403
Total	5,160	352	985	1,276	1,049	1,498	31,178	4,802	7,830	7,187	11,359
Hardwoods:											
Red alder	9	6	1	2	--	--	24	8	16	--	--
Other hardwoods	48	23	13	9	3	--	166	70	73	23	--
Total	57	29	14	11	3	--	190	78	89	23	--
All species	5,217	381	999	1,287	1,052	1,498	31,368	4,880	7,919	7,210	11,359
MCKENZIE											
Softwoods:											
Douglas-fir	2,153	117	335	633	458	610	12,960	1,592	3,872	3,086	4,410
Western hemlock	276	34	74	85	64	19	1,571	401	565	468	137
True firs	413	133	91	92	50	47	1,682	432	563	341	346
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	318	87	93	82	42	14	1,292	446	497	269	80
Total	3,160	371	593	892	614	690	17,505	2,871	5,497	4,164	4,973
Hardwoods:											
Red alder	16	--	11	2	3	--	99	58	12	29	--
Other hardwoods	38	13	9	7	7	2	187	52	54	64	17
Total	54	13	20	9	10	2	286	110	66	93	17
All species	3,214	384	613	901	624	692	17,791	2,981	5,563	4,257	4,990
LONG TOM											
Softwoods:											
Douglas-fir	202	21	71	42	32	36	1,106	351	263	220	272
Western hemlock	7	5	--	2	--	--	16	--	16	--	--
True firs	5	1	4	--	--	--	27	27	--	--	--
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	13	--	--	6	7	--	80	--	40	40	--
Total	227	27	75	50	39	36	1,229	378	319	260	272
Hardwoods:											
Red alder	12	7	5	--	--	--	24	24	--	--	--
Other hardwoods	38	14	20	4	--	--	126	93	33	--	--
Total	50	21	25	4	--	--	150	117	33	--	--
All species	277	48	100	54	39	36	1,379	495	352	260	272

Table 11.--Volume of growing stock and sawtimber on commercial forest land in the middle Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)				
	Total	Diameter class (inches)					Total	Diameter class (inches)			
		5.0- 10.9	11.0- 18.9	19.0- 28.9	29.0- 38.9	39.0 and larger		11.0- 18.9	19.0- 28.9	29.0- 38.9	39.0 and larger
- - - - - <u>Million cubic feet</u> - - - - - <u>Million board feet</u> - - - - -											
Softwoods:											
Douglas-fir	5,622	392	1,070	1,262	1,205	1,693	34,159	5,173	7,953	8,402	12,631
Western hemlock	1,557	120	341	478	449	169	9,588	1,914	3,233	3,210	1,231
True firs	540	91	146	185	84	34	2,612	729	1,096	538	249
Sitka spruce	4	--	--	1	3	--	19	1	1	16	1
Other softwoods	355	44	119	105	59	28	1,750	574	625	377	174
Total	8,078	647	1,676	2,031	1,800	1,924	48,128	8,391	12,908	12,543	14,286
Hardwoods:											
Red alder	163	62	84	14	3	--	516	410	89	17	--
Other hardwoods	573	336	145	66	21	5	1,682	1,009	480	155	38
Total	736	398	229	80	24	5	2,198	1,419	569	172	38
All species	8,814	1,045	1,905	2,111	1,824	1,929	50,326	9,810	13,477	12,715	14,324

Table 12.--Volume of growing stock and sawtimber on commercial forest land in the subbasins
of the middle Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)				
	Total	Diameter class (inches)					Total	Diameter class (inches)			
		5.0-10.9	11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger		11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger
----- Million cubic feet ----- Million board feet -----											
SANTIAM											
Softwoods:											
Douglas-fir	3,716	183	554	775	842	1,362	23,313	2,663	4,810	5,798	10,042
Western hemlock	1,342	101	292	417	385	147	8,280	1,628	2,813	2,759	1,080
True firs	485	76	125	166	84	34	2,381	614	986	536	245
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	327	41	108	98	55	25	1,597	516	576	347	158
Total	5,870	401	1,079	1,456	1,366	1,568	35,571	5,421	9,185	9,440	11,525
Hardwoods:											
Red alder	48	23	25	--	--	--	134	132	2	--	--
Other hardwoods	115	31	50	23	10	1	513	271	162	74	6
Total	163	54	75	23	10	1	647	403	164	74	6
All species	6,033	455	1,154	1,479	1,376	1,569	36,218	5,824	9,349	9,514	11,531
COAST RANGE											
Softwoods:											
Douglas-fir	1,291	129	322	288	270	282	7,631	1,578	1,893	1,952	2,208
Western hemlock	35	2	10	13	6	4	205	54	87	38	26
True firs	12	3	6	3	--	--	59	36	17	2	4
Sitka spruce	4	--	--	1	3	--	19	1	1	16	1
Other softwoods	1	--	--	--	--	1	12	2	2	3	5
Total	1,343	134	338	305	279	287	7,926	1,671	2,000	2,011	2,244
Hardwoods:											
Red alder	98	29	54	12	3	--	346	253	76	17	--
Other hardwoods	383	273	64	37	7	2	913	578	263	53	19
Total	481	302	118	49	10	2	1,259	831	339	70	19
All species	1,824	436	456	354	289	289	9,185	2,502	2,339	2,081	2,263
PUDDING											
Softwoods:											
Douglas-fir	615	80	194	199	93	49	3,215	932	1,250	652	381
Western hemlock	180	17	39	48	58	18	1,103	232	333	413	125
True firs	43	12	15	16	--	--	172	79	93	--	--
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	27	3	11	7	4	2	141	56	47	27	11
Total	865	112	259	270	155	69	4,631	1,299	1,723	1,092	517
Hardwoods:											
Red alder	17	10	5	2	--	--	36	25	11	--	--
Other hardwoods	75	32	31	6	4	2	256	160	55	28	13
Total	92	42	36	8	4	2	292	185	66	28	13
All species	957	154	295	278	159	71	4,923	1,484	1,789	1,120	530

Table 13 .--Volume of growing stock and sawtimber on commercial forest land in the

lower Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)				
	Total	Diameter class (inches)					Total	Diameter class (inches)			
		5.0-10.9	11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger		11.0-18.9	19.0-28.9	29.0-38.9	39.0 and larger
- - - - - <u>Million cubic feet</u> - - - - - <u>Million board feet</u> - - - - -											
Softwoods:											
Douglas-fir	3,411	371	810	869	662	699	20,248	3,862	5,626	4,935	5,825
Western hemlock	1,182	112	353	417	186	114	6,804	1,894	2,722	1,324	864
True firs	632	120	193	177	85	57	2,972	928	1,067	565	412
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--
Other softwoods	614	111	197	181	60	65	3,033	970	1,153	416	494
Total	5,839	714	1,553	1,644	993	935	33,057	7,654	10,568	7,240	7,595
Hardwoods:											
Red alder	216	94	111	9	2	--	675	595	63	17	--
Other hardwoods	110	66	36	6	2	--	267	185	68	14	--
Total	326	160	147	15	4	--	942	780	131	31	--
All species	6,165	874	1,700	1,659	997	935	33,999	8,434	10,699	7,271	7,595

Table 14.--Volume of growing stock and sawtimber on commercial forest land in the subbasins
of the lower Willamette River basin by species and diameter group, 1963

Species	Growing stock						Sawtimber (International 1/4-inch rule)					
	Total	Diameter class (inches)					Total	Diameter class (inches)				
		5.0- 10.9	11.0- 18.9	19.0- 28.9	29.0- 38.9	39.0 and larger		11.0- 18.9	19.0- 28.9	29.0- 38.9	39.0 and larger	
----- Million cubic feet ----- Million board feet -----												
TUALATIN												
Softwoods:												
Douglas-fir	285	82	120	45	21	17	1,139	578	284	147	130	
Western hemlock	9	1	3	5	--	--	50	16	34	--	--	
True firs	11	3	6	2	--	--	46	32	14	--	--	
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--	
Other softwoods	5	2	3	--	--	--	13	13	--	--	--	
Total	310	88	132	52	21	17	1,248	639	332	147	130	
Hardwoods:												
Red alder	53	30	23	--	--	--	118	118	--	--	--	
Other hardwoods	40	29	8	3	--	--	60	55	5	--	--	
Total	93	59	31	3	--	--	178	173	5	--	--	
All species	403	147	163	55	21	17	1,426	812	337	147	130	
GLACKAMAS												
Softwoods:												
Douglas-fir	2,035	111	376	614	512	422	13,138	1,811	4,000	3,840	3,487	
Western hemlock	804	83	276	300	106	39	4,486	1,486	1,953	748	299	
True firs	438	80	130	114	70	44	2,086	620	683	468	315	
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--	
Other softwoods	455	86	157	137	45	30	2,198	778	875	318	227	
Total	3,732	360	939	1,165	733	535	21,908	4,695	7,511	5,374	4,328	
Hardwoods:												
Red alder	43	11	28	2	2	--	183	152	14	17	--	
Other hardwoods	28	17	10	1	--	--	50	44	6	--	--	
Total	71	28	38	3	2	--	233	196	20	17	--	
All species	3,803	388	977	1,168	735	535	22,141	4,891	7,531	5,391	4,328	
COLUMBIA												
Softwoods:												
Douglas-fir	191	66	61	28	31	5	707	275	177	216	39	
Western hemlock	12	--	--	12	--	--	83	--	83	--	--	
True firs	--	--	--	--	--	--	--	--	--	--	--	
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--	
Other softwoods	13	2	6	3	--	2	66	29	21	--	16	
Total	216	68	67	43	31	7	856	304	281	216	55	
Hardwoods:												
Red alder	54	32	18	4	--	--	122	95	27	--	--	
Other hardwoods	19	12	3	2	2	--	72	46	12	14	--	
Total	73	44	21	6	2	--	194	141	39	14	--	
All species	289	112	88	49	33	7	1,050	445	320	230	55	
SANDY												
Softwoods:												
Douglas-fir	900	112	253	182	98	255	5,264	1,198	1,165	732	2,169	
Western hemlock	357	28	74	100	80	75	2,185	392	652	576	565	
True firs	183	37	57	61	15	13	840	276	370	97	97	
Sitka spruce	--	--	--	--	--	--	--	--	--	--	--	
Other softwoods	141	21	31	41	15	33	756	150	257	98	251	
Total	1,581	198	415	384	208	376	9,045	2,016	2,444	1,503	3,082	
Hardwoods:												
Red alder	66	21	42	3	--	--	252	230	22	--	--	
Other hardwoods	23	8	15	--	--	--	85	40	45	--	--	
Total	89	29	57	3	--	--	337	270	67	--	--	
All species	1,670	227	472	387	208	376	9,382	2,286	2,511	1,503	3,082	

Table 15.--Volume of growing stock and sawtimber on commercial forest
land in the Willamette River basin by ownership
class and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	- - - - <u>Million cubic feet</u> - - - -			- - - - <u>Million board feet</u> - - - -		
National Forest	16,290	16,154	136	95,849	95,464	385
Other public	3,248	3,083	165	18,943	18,455	488
Forest industry	3,043	2,913	130	18,024	17,584	440
Farmer owned and miscellaneous private	2,939	2,092	847	13,301	10,706	2,595
All owners	25,520	24,242	1,278	146,117	142,209	3,908

Table 16.--Volume of growing stock and sawtimber on commercial forest land
in the upper Willamette River basin by ownership class
and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	- - - - <u>Million cubic feet</u> - - - -			- - - - <u>Million board feet</u> - - - -		
National Forest	8,475	8,408	67	49,696	49,537	159
Other public	948	928	20	5,953	5,900	53
Forest industry	893	858	35	5,240	5,083	157
Farmer owned and miscellaneous private	225	131	94	903	504	399
All owners	10,541	10,325	216	61,792	61,024	768

Table 17.--Volume of growing stock and sawtimber on commercial forest
land in the subbasins of the upper Willamette River basin
by ownership class and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
- - - - <u>Million cubic feet</u> - - - - - - - - <u>Million board feet</u> - - - -						
COAST FORK						
National Forest	774	747	27	4,824	4,756	68
Other public	618	613	5	4,020	4,005	15
Forest industry	400	398	2	2,322	2,311	11
Farmer owned and miscellaneous private	41	20	21	88	40	48
All owners	1,833	1,778	55	11,254	11,112	142
MIDDLE FORK						
National Forest	4,929	4,902	27	29,703	29,656	47
Other public	69	69	--	425	425	--
Forest industry	184	159	25	1,084	974	110
Farmer owned and miscellaneous private	35	30	5	156	123	33
All owners	5,217	5,160	57	31,368	31,178	190
MCKENZIE						
National Forest	2,772	2,759	13	15,169	15,125	44
Other public	108	100	8	597	588	9
Forest industry	300	296	4	1,790	1,781	9
Farmer owned and miscellaneous private	34	5	29	235	11	224
All owners	3,214	3,160	54	17,791	17,505	286
LONG TOM						
National Forest	--	--	--	--	--	--
Other public	153	146	7	911	882	29
Forest industry	9	5	4	44	17	27
Farmer owned and miscellaneous private	115	76	39	424	330	94
All owners	277	227	50	1,379	1,229	150

Table 18.--Volume of growing stock and sawtimber on commercial forest
land in the middle Willamette River basin by ownership
class and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	- - - - <u>Million cubic feet</u> - - - -			- - - - <u>Million board feet</u> - - - -		
National Forest	3,103	3,077	26	18,204	18,103	101
Other public	1,881	1,784	97	11,192	10,887	305
Forest industry	1,969	1,892	77	11,945	11,703	242
Farmer owned and miscellaneous private	1,861	1,325	536	8,985	7,435	1,550
All owners	8,814	8,078	736	50,326	48,128	2,198

Table 19.--Volume of growing stock and sawtimber on commercial forest
land in the subbasins of the middle Willamette River basin
by ownership class and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
- - - <u>Million cubic feet</u> - - - - - <u>Million board feet</u> - - - -						
SANTIAM						
National Forest	2,946	2,933	13	17,005	16,965	40
Other public	836	790	46	4,806	4,632	174
Forest industry	1,280	1,268	12	8,794	8,769	25
Farmer owned and miscellaneous private	971	879	92	5,613	5,205	408
All owners	6,033	5,870	163	36,218	35,571	647
COAST RANGE						
National Forest	157	144	13	1,199	1,138	61
Other public	596	564	32	3,688	3,582	106
Forest industry	356	291	65	1,630	1,413	217
Farmer owned and miscellaneous private	715	344	371	2,668	1,793	875
All owners	1,824	1,343	481	9,185	7,926	1,259
PUDDING						
National Forest	--	--	--	--	--	--
Other public	449	430	19	2,698	2,673	25
Forest industry	333	333	--	1,521	1,521	--
Farmer owned and miscellaneous private	175	102	73	704	437	267
All owners	957	865	92	4,923	4,631	292

Table 20.--Volume of growing stock and sawtimber on commercial forest
land in the lower Willamette River basin by ownership
class and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	- - - - <u>Million cubic feet</u> - - - -			- - - - <u>Million board feet</u> - - - -		
National Forest	4,712	4,669	43	27,949	27,824	125
Other public	419	371	48	1,798	1,668	130
Forest industry	181	163	18	839	798	41
Farmer owned and miscellaneous private	853	636	217	3,413	2,767	646
All owners	6,165	5,839	326	33,999	33,057	942

Table 21.--Volume of growing stock and sawtimber on commercial forest
land in the subbasins of the lower Willamette River basin
by ownership class and softwoods and hardwoods, 1963

Ownership class	Growing stock			Sawtimber (International 1/4-inch rule)		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
- - - - <u>Million cubic feet</u> - - - - - - - <u>Million board feet</u> - - - -						
TUALATIN						
National Forest	--	--	--	--	--	--
Other public	120	86	34	473	397	76
Forest industry	--	--	--	--	--	--
Farmer owned and miscellaneous private	283	224	59	953	851	102
All owners	403	310	93	1,426	1,248	178
CLACKAMAS						
National Forest	3,383	3,362	21	20,281	20,223	58
Other public	125	125	--	585	585	--
Forest industry	2	2	--	13	13	--
Farmer owned and miscellaneous private	293	243	50	1,262	1,087	175
All owners	3,803	3,732	71	22,141	21,908	233
COLUMBIA						
National Forest	--	--	--	--	--	--
Other public	31	31	--	20	20	--
Forest industry	116	98	18	512	471	41
Farmer owned and miscellaneous private	142	87	55	518	365	153
All owners	289	216	73	1,050	856	194
SANDY						
National Forest	1,329	1,307	22	7,668	7,601	67
Other public	143	129	14	720	666	54
Forest industry	63	63	--	314	314	--
Farmer owned and miscellaneous private	135	82	53	680	464	216
All owners	1,670	1,581	89	9,382	9,045	337

Table 22.--Trend of net annual growth of growing stock and
sawtimber on commercial forest land of the
Willamette River basin by basin area, 1963-2000

Basin area	Growing stock					Sawtimber (International 1/4-inch rule)				
	1963	1970	1980	1990	2000	1963	1970	1980	1990	2000
	- - - - <u>Million cubic feet</u> - - - -					- - - <u>Million board feet</u> - - -				
Upper basin	46	54	66	73	78	222	262	318	359	370
Middle basin	95	107	120	128	126	405	452	516	552	521
Lower basin	32	38	45	49	50	121	142	172	191	192
Total	173	199	231	250	254	748	856	1,006	1,102	1,083

Table 23.--Annual log production in the Willamette River basin by owner class and county, 1950-63

(In thousand board feet, International 1/4-inch rule)

County and owner class	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Willamette River basin:														
Private	2,895,567	2,987,533	3,116,960	2,430,949	2,294,303	2,191,151	2,351,164	1,736,329	1,566,852	1,424,399	1,644,905	1,744,109	1,734,412	1,637,204
Bureau of Land Management	181,943	200,761	205,537	253,998	274,664	216,470	208,772	244,019	283,785	346,580	298,038	336,228	384,217	525,678
National Forest	573,687	550,030	669,523	795,050	823,536	861,724	843,934	756,547	1,001,816	1,338,590	1,097,981	1,131,201	1,553,650	1,494,507
Indian	1,207	--	--	105	--	--	--	--	--	--	--	--	--	--
State	136,176	139,241	76,693	86,021	74,064	78,906	53,721	57,717	13,019	24,050	27,225	23,786	24,609	59,570
All Willamette River basin	3,788,580	3,877,565	4,068,713	3,566,123	3,466,567	3,348,251	3,457,591	2,794,612	2,865,472	3,133,619	3,068,149	3,235,324	3,696,888	3,716,959
Benton:														
Private	214,341	227,555	200,678	194,354	166,290	170,607	197,597	122,230	107,263	89,068	94,778	80,824	53,860	55,384
Bureau of Land Management	19,108	7,021	13,268	8,273	27,477	24,389	13,062	13,589	28,214	52,281	39,182	22,755	35,052	42,830
National Forest	1,448	5,069	7,001	8,208	21,605	9,043	24,985	16,536	10,288	14,504	10,185	17,019	7,363	48,159
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	358	380	--	--	303	3,098	2,076	257	1,957	3,937	8,340	3,249	5,282	10,712
Total	235,255	240,025	220,947	210,835	215,675	207,137	237,720	152,612	147,722	159,790	152,485	123,847	101,557	157,085
Clackamas:														
Private	329,111	327,463	363,739	281,327	285,008	262,773	279,789	236,570	185,677	188,734	149,361	129,876	144,778	124,837
Bureau of Land Management	10,803	24,939	7,363	16,048	15,877	25,205	20,398	21,522	22,078	32,354	17,033	15,819	40,695	24,815
National Forest	114,303	139,650	118,165	171,152	140,133	215,754	197,465	141,581	220,898	313,372	250,733	223,713	251,780	256,246
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	--	--	--	--	--	--	2,130	1,064	11	2,187	338	1,161	212	3,026
Total	454,217	492,052	489,267	468,527	441,018	503,732	499,782	400,737	428,664	536,647	417,465	370,569	437,465	408,924
Columbia:														
Private	65,851	42,099	60,870	80,275	52,162	69,038	142,990	127,980	91,596	92,326	112,985	41,808	44,259	114,285
Bureau of Land Management	--	--	775	--	13,096	6,509	433	3,094	6,731	4,276	1,642	1,774	--	1,622
National Forest	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	43	--	6	--	--	--	241	--	--	--	75	1,176	--	1,429
Total	65,894	42,099	61,651	80,275	65,258	75,547	143,664	131,074	98,327	96,602	114,702	44,758	44,259	117,336

Table 23.--Annual log production in the Willamette River basin by owner class and county, 1950-63--continued

(In thousand board feet, International 1/4-inch rule)

County and owner class	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Lane:														
Private	1,084,473	1,262,656	1,327,516	997,278	895,544	869,210	729,045	620,918	594,187	430,408	843,662	982,396	970,655	705,382
Bureau of Land Management	85,217	107,369	120,869	150,869	128,432	87,862	102,878	83,780	138,471	131,166	127,832	164,588	178,908	296,071
National Forest	364,393	338,805	393,965	414,604	471,816	501,318	489,559	450,090	582,713	740,013	584,718	604,960	882,800	846,228
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	7,955	3,354	2,442	3,545	4,575	2,810	1,102	4,262	2,428	5,746	4,975	9,208	6,101	8,646
Total	1,542,038	1,712,184	1,844,792	1,566,296	1,500,367	1,461,200	1,322,584	1,159,050	1,317,799	1,307,333	1,561,187	1,761,152	2,038,464	1,856,327
Linn:														
Private	619,275	563,926	580,696	463,233	463,676	428,183	515,182	365,537	281,163	311,598	256,461	412,992	396,612	456,809
Bureau of Land Management	26,134	31,387	21,232	60,870	41,897	39,922	41,912	61,615	39,955	60,352	48,562	62,220	54,829	75,250
National Forest	45,987	55,160	100,785	119,734	134,460	105,711	104,888	139,891	139,933	179,690	186,599	176,899	286,904	207,483
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	3,874	13,693	9,305	3,810	4,968	2,956	888	8,815	2,240	1,591	4,401	1,504	--	756
Total	695,270	664,166	712,018	647,647	645,001	576,772	662,870	575,858	463,291	553,231	496,023	653,615	738,345	740,298
Marion:														
Private	113,860	130,472	96,789	112,743	47,693	59,267	66,378	34,359	51,210	38,949	47,006	28,008	11,720	12,462
Bureau of Land Management	9,719	17,932	10,643	--	15,636	6,112	3,872	10,620	9,378	15,323	23,949	16,647	11,853	16,173
National Forest	41,762	7,121	35,606	64,333	38,383	16,916	25,830	7,725	43,320	71,864	44,391	79,634	94,387	104,526
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	2,923	11,596	4,502	18,206	27,862	3,075	135	606	3,346	8,119	8,025	2,943	10,018	28,794
Total	168,264	167,121	147,540	195,282	129,574	85,370	96,215	53,310	107,254	134,255	123,371	127,232	127,978	161,955
Multnomah:														
Private	25,512	20,107	24,507	15,819	19,716	15,835	20,822	9,856	4,967	5,057	19,068	7,845	11,369	5,987
Bureau of Land Management	--	595	--	--	--	--	--	578	485	--	--	--	161	437
National Forest	--	121	--	121	1,448	404	1,207	241	4,664	15,130	15,115	28,538	29,692	28,365
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	25,512	20,823	24,507	15,940	21,164	16,239	22,029	10,675	10,116	20,187	34,183	36,383	41,222	34,789

Table 23.--Annual log production in the Willamette River basin by owner class and county, 1950-63--continued

(In thousand board feet, International 1/4-inch rule)

County and owner class	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Polk:														
Private	277,262	267,560	229,486	126,935	200,432	196,987	237,138	126,448	139,824	173,672	64,842	30,170	71,561	122,017
Bureau of Land Management	13,766	11,476	15,884	12,189	19,694	16,862	22,602	41,434	27,846	34,284	28,193	29,963	30,047	56,095
National Forest	5,794	4,104	13,518	16,898	15,691	12,521	--	483	--	4,017	--	438	724	3,259
Indian	--	--	--	29	--	--	--	--	--	--	--	--	--	--
State	--	--	--	--	127	4,873	4,904	468	2,274	220	192	2,608	623	3,547
Total	296,822	283,140	258,888	156,051	235,944	231,243	264,644	168,833	169,944	212,193	93,227	63,179	102,955	184,918
Washington:														
Private	28,295	11,373	94,337	107,295	86,245	33,707	70,170	34,769	46,165	42,086	27,245	10,175	21,049	27,011
Bureau of Land Management	--	--	4,647	--	2,217	6,775	1,352	3,640	3,154	881	--	--	4,962	1,002
National Forest	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indian	--	--	--	--	--	--	--	--	--	--	--	--	--	--
State	121,023	110,218	60,438	60,460	36,229	62,094	42,245	42,245	763	2,250	879	1,937	2,373	2,585
Total	149,318	121,591	159,422	167,755	124,691	102,576	113,767	80,654	50,082	45,217	28,124	12,112	28,384	30,598
Yamhill:														
Private	137,587	134,322	138,342	51,690	77,537	85,544	92,053	57,662	64,800	52,501	29,497	20,015	8,549	13,030
Bureau of Land Management	17,196	42	10,856	5,749	10,338	2,834	2,263	4,147	7,473	15,663	11,645	22,462	27,710	11,383
National Forest	--	--	483	--	--	57	--	--	--	--	6,240	--	--	241
Indian	1,207	--	--	76	--	--	--	--	--	--	--	--	--	--
State	--	--	--	--	--	--	--	--	--	--	--	--	--	75
Total	155,990	134,364	149,681	57,515	87,875	88,435	94,316	61,809	72,273	68,164	47,382	42,477	36,259	24,729

Table 24 .--Output of timber products, Willamette River basin, 1963

County	Lumber ^{1/}	Veneer and plywood ^{2/} (3/8-inch)	Woodpulp ^{3/}	Particle board ^{4/} (3/4-inch)	Miscellaneous products ^{5/}
	<u>Thousand board feet</u>	<u>Thousand square feet</u>	<u>Tons</u>	<u>Million square feet</u>	<u>Thousand cubic feet</u>
Benton	290,768	251,000	24,618	--	723
Clackamas	195,778	80,000	307,728	--	1,833
Columbia	266,705	55,800	172,327	--	520
Lane	1,240,432	1,348,000	123,091	22	8,442
Linn	467,775	1,086,000	110,782	60	3,340
Marion	120,970	--	49,236	--	731
Multnomah	141,099	296,000	--	--	153
Polk	200,896	289,000	--	--	857
Washington	66,962	--	36,927	--	134
Yamhill	117,976	107,846	49,236	--	115
Total	3,109,361	3,513,646	873,945	82	16,848

^{1/} Western Wood Products Assoc. Statistical Yearbook. 1963.

^{2/} Forest Industries, 33rd Annual Plywood Review. 1964.

^{3/} Based on 1962 Pulp, Paper, and Board by the Bureau of Census production figures and allocated according to plant capacity estimates in the 1963 Lockwood's Directory of the Paper and Allied Trades.

^{4/} Based on 1964 Directory of the Forest Products Industry.

^{5/} Based on unpublished file data of the Pac. NW. Forest & Range Expt. Sta. allocated on the basis of 1963 log production (includes piling, poles, posts, fuelwood, ties, excelsior, shingles, bolts, etc.).

Table 25.--Number of forest industry establishments and average annual covered employment by major industry groups and basin area, Willamette River basin, 1963

Major industry group	Basin area			
	Upper basin	Middle basin	Lower basin	Total
All industries:				
Reporting units	367	439	417	1,223
Employees	14,218	11,693	13,264	39,175
Logging:				
Reporting units	213	245	178	636
Employees	2,460	1,841	1,234	5,535
Lumber and wood products: ^{1/}				
Reporting units	114	155	187	456
Sawmills only	80	115	98	293
Employees	5,405	4,157	4,871	14,433
Sawmill employees	4,328	3,602	2,243	10,173
Veneer and plywood:				
Reporting units	34	30	18	82
Employees	6,014	4,476	2,345	12,835
Paper and allied products: ^{2/}				
Reporting units	6	9	34	49
Employees	339	1,219	4,814	6,372

^{1/} Includes planing mills, millwork plants, wooden container plants, and wood preserving plants.

^{2/} Includes pulp plants, paper and board plants, paper container plants, and other pulp or paper based plants.

Table 26 .--Estimated consumption of roundwood for timber products
by 5-year periods, 1965-85, in the Willamette River
basin by basin area

Basin area	1965	1970	1975	1980	1985
- - - - - <u>Million cubic feet</u> - - - - -					
Upper basin	321	323	327	296	332
Middle basin	356	364	371	376	383
Lower basin	148	155	161	167	173
Total	825	842	859	839	888
- - - <u>Million board feet, International 1/4-inch rule</u>					
Upper basin	2,078	2,084	2,108	2,109	2,137
Middle basin	2,293	2,354	2,396	2,430	2,476
Lower basin	953	1,000	1,038	1,076	1,116
Total	5,324	5,438	5,542	5,615	5,729

Table 27.--Estimated consumption of saw logs by 5-year periods,
1965-85, in the Willamette River basin by basin area

Basin area	1965	1970	1975	1980	1985
<u> - - - - - Million cubic feet - - - - -</u>					
Upper basin	164	148	138	128	122
Middle basin	159	142	133	123	117
Lower basin	69	62	58	54	51
Total	392	352	329	305	290
<u> - - Million board feet, International 1/4-inch rule- -</u>					
Upper basin	1,061	954	891	827	785
Middle basin	1,023	921	860	798	757
Lower basin	445	400	373	347	329
Total	2,529	2,275	2,124	1,972	1,871

Table 28.--Estimated consumption of veneer logs by 5-year periods,
1965-85, in the Willamette River basin by basin area

Basin area	1965	1970	1975	1980	1985
<u>----- Million cubic feet -----</u>					
Upper basin	133	150	160	168	178
Middle basin	172	193	205	217	228
Lower basin	43	48	51	54	57
Total	348	391	416	439	463
<u>- - Million board feet, International 1/4-inch rule - -</u>					
Upper basin	862	969	1,030	1,089	1,146
Middle basin	1,109	1,246	1,324	1,400	1,474
Lower basin	276	310	329	348	367
Total	2,247	2,525	2,683	2,837	2,987

Table 29.--Estimated consumption of pulpwood by 5-year periods,
1965-85, in the Willamette River basin by subbasin
(In million cubic feet)

Subbasin	1965	1970	1975	1980	1985
Upper basin	21	25	29	32	37
Middle basin	38	47	54	62	69
Lower basin	83	105	119	137	153
Total	142	177	202	231	259

Table 30.--Estimated consumption of round pulpwood by 5-year periods,
1965-85, in the Willamette River basin by basin area

Basin area	1965	1970	1975	1980	1985
- - - - - <u>Million cubic feet</u> - - - - -					
Upper basin	8	9	11	12	14
Middle basin	14	18	21	24	26
Lower basin	31	40	46	53	59
Total	53	67	78	89	99
- <u>Million board feet, International 1/4-inch rule</u> - -					
Upper basin	52	58	71	77	90
Middle basin	90	116	135	155	168
Lower basin	200	258	297	342	381
Total	342	432	503	574	639

Table 31.--Estimated consumption of pulpwood chips by 5-year periods,
1965-85, in the Willamette River basin by basin area

Basin area	1965	1970	1975	1980	1985
- - - - - <u>Million cubic feet</u> - - - - -					
Upper basin	13	16	18	20	23
Middle basin	24	29	33	38	43
Lower basin	52	65	73	84	94
Total	89	110	124	142	160

Table 32.--Estimated consumption of miscellaneous wood products by 5-year periods, 1965-85, in the Willamette River basin by basin area

Basin area	1965	1970	1975	1980	1985
- - - - - <u>Million cubic feet</u> - - - - -					
Upper basin	16	16	18	18	18
Middle basin	11	11	12	12	12
Lower basin	5	5	6	6	6
Total	32	32	36	36	36
- <u>Million board feet, International 1/4-inch rule</u> - -					
Upper basin	103	103	116	116	116
Middle basin	71	71	77	77	77
Lower basin	32	32	39	39	39
Total	206	206	232	232	232

Table 33.--Estimated average annual employment by industry, by 5-year periods, 1965-85,
in the Willamette River basin by basin area

Basin area and year	Total	Lumber and wood products	Plywood and veneer	Pulp and paper	Logging
Willamette River basin:					
1965	40,900	13,600	15,100	6,700	5,500
1970	40,100	12,100	15,300	7,300	5,400
1975	38,900	11,100	14,800	7,800	5,200
1980	37,900	10,200	14,400	8,200	5,100
1985	37,400	9,700	14,200	8,600	4,900
Upper basin:					
1965	15,000	5,100	7,100	300	2,500
1970	14,500	4,500	7,200	400	2,400
1975	13,800	4,200	6,900	400	2,300
1980	13,300	3,800	6,800	400	2,300
1985	12,900	3,600	6,600	500	2,200
Middle basin:					
1965	12,300	3,900	5,300	1,300	1,800
1970	12,000	3,500	5,300	1,400	1,800
1975	11,600	3,200	5,200	1,500	1,700
1980	11,200	2,900	5,000	1,600	1,700
1985	11,000	2,800	5,000	1,600	1,600
Lower basin:					
1965	13,600	4,600	2,700	5,100	1,200
1970	13,600	4,100	2,800	5,500	1,200
1975	13,500	3,700	2,700	5,900	1,200
1980	13,400	3,500	2,600	6,200	1,100
1985	13,500	3,300	2,600	6,500	1,100

Table 34.--Population, households, gross national product and disposable personal income in the United States, 1920-2000^{1/}

Year	Population	Households	Persons per household	Gross national product (1961 dollars)	Disposable personal income (1961 dollars)	
					Total	Per capita
- - - - <u>-Million-</u> - - - -				- - - <u>Billion-</u> - - -		
1920	106.5	24.4	4.36	143.0	--	--
1930	123.2	29.9	4.12	190.3	140.6	1,141
1940	132.1	34.9	3.79	268.8	170.2	1,288
1950	152.3	43.0	3.54	366.5	256.7	1,685
1960	180.7	53.0	3.41	511.1	355.7	1,968
1962	186.7	54.7	3.41	546.0	379.0	2,030
<u>Projections</u>						
1970	208.0	62.5	3.33	710.0	500.0	2,400
1975	223.0	--	--	84.0	--	--
1980	241.0	73.5	3.28	990.0	690.0	2,860
1985	260.0	--	--	1,175.0	--	--
1990	280.0	86.2	3.25	1,380.0	960.0	3,430
2000	325.0	101.0	3.22	1,920.0	1,340.0	4,120

^{1/} Based on tables 1 and 2, pp. 6 and 8, "Timber Trends in the United States."

Sources: POPULATION: 1920-40, U.S. Dept. Com., Bur. Census, Historical Statistics of the United States, 1960. 1950-62, "Estimates of the Population of the United States, January 1, 1950, to March 1, 1964." Population Estimates, 1964 (Cur. Population Rpts., Ser. P-25, No. 283). Projections are derived from estimates published by the U.S. Dept. Com., Bur. Census in "Projections of the Population of the United States by Age and Sex: 1964 to 1985 with Extensions to 2010." Population Estimates July 1964, (Cur. Population Rpts., Ser. P-25, No. 286).

Sources for table 34--continued

NUMBER OF HOUSEHOLDS: 1920-40, Bur. Census, Census of Housing, 1950, vol. I, Part 1, 1953. 1950 and 1960, Bur. Census, "Components of Inventory Change." United States Census of Housing, 1960, vol. IV, Part 1-A, 1962, and from unpublished data furnished by the Bur. Census. 1962, "Households and Families, by Type: 1962." Population Characteristics, 1962 (Cur. Population Rpts., Ser. P-20, No. 119). Projections, 1970 and 1980, U.S. Dept. Agr., Forest Service, derived from projections published by the U.S. Dept. Com., Bur. Census, "Interim Revised Projections of the Number of Households and Families: 1965 to 1980." Population Characteristics, 1963 (Cur. Population Rpts., Ser. P-20, No. 123). 1990 and 2000, derived from population estimates and assumed trend in number of persons per household.

GROSS NATIONAL PRODUCT: 1920, derived from data published by the Joint Com. Econ. Rpt., Potential Economic Growth of the United States During the Next Decade, 1954. 1930-62, Office of the President, Economic Report of the President, January 1962 and 1964.

DISPOSABLE PERSONAL INCOME: 1930-62, Office of the President, Economic Report of the President, January 1962 and 1964.

PROJECTIONS: U.S. Dept. Agr., Forest Service, derived in part from data published by the Outdoor Recreation Resources Rev. Comm. Staff, Natl. Planning Assoc., and U.S. Dept. Labor, Bur. Labor Statis., Projections to the Years 1976 and 2000: Economic Growth, Population, Labor Force and Leisure, and Transportation, 1962 (ORRRC Study Rpt. No. 23).

Table 35.--Summary of total demand for major timber products in the United States, 1952-85

Product	Standard unit of measure	1952	1962	Projections			
				1970	1975	1980	1985
Lumber:							
Total	Million board feet	41,460	37,300	39,700	41,600	43,400	45,500
Per capita	Board feet	263	200	191	187	180	175
Plywood and veneer:							
Softwoods	Million square feet, 3/8-inch basis	--	9,250	14,400	15,600	17,000	18,500
Hardwoods	Million square feet, 3/8-inch basis	--	2,770	3,500	4,200	5,000	5,700
Total		--	12,020	17,900	19,800	22,000	24,200
Per capita	Square feet	--	64	86	89	91	93
Woodpulp:							
Total	Million tons	--	29.5	38.2	44.8	52.4	60.5
Paper and board:							
Total	Million tons	--	42.4	52.7	60.2	69.3	79.2
Per capita	Pounds	--	454	507	540	575	609

Table 36.--Summary of consumption, net imports, and domestic productionof timber products in the United States, 1952-85

Product	Standard unit of measure	1952	1962	Projections			
				1970	1975	1980	1985
Lumber:							
Consumption	Million board feet, International 1/4-inch rule	41,460	37,300	39,700	41,600	43,400	45,500
Net imports	"	1,752	4,130	5,100	5,400	5,800	6,100
Domestic production	"	39,708	33,170	34,600	36,200	37,600	39,400
Domestic roundwood ^{1/}	"	39,480	34,105	35,600	37,200	38,600	40,400
Veneer logs:							
Consumption	"	3,082	6,776	10,300	11,300	12,500	13,900
Net imports ^{2/}	"	148	860	1,300	1,600	1,900	2,300
Domestic production	"	2,934	5,916	9,000	9,700	10,600	11,600
Domestic roundwood	"	2,934	5,916	9,000	9,700	10,600	11,600
Pulpwood:							
Consumption ^{3/}	Million standard cords	35.4	52.8	67.5	78.0	88.5	99.5
Net imports	"	11.0	10.1	11.0	11.2	11.5	12.2
Domestic production	"	25.0	42.8	56.6	66.8	77.8	87.3
Domestic roundwood	"	23.4	33.8	42.0	50.8	60.0	69.3

Table 36.--Summary of consumption, net imports, and domestic production...--continued

Product	Standard unit of measure	1952	1962	Projections			
				1970	1975	1980	1985
Miscellaneous industrial wood:							
Consumption	Million cubic feet	758	505	500	500	500	500
Net imports	"	(4/)	(4/)	--	--	--	--
Domestic production	"	758	505	500	500	500	500
Domestic roundwood	"	699	466	460	460	460	460
Fuelwood:							
Consumption ^{5/}	Million standard cords	58.6	26.9	22.0	20.0	18.0	16.5
Net imports	"	(4/)	(4/)	--	--	--	--
Domestic production	"	58.6	26.9	22.0	20.0	18.0	16.5
Domestic roundwood	"	27.2	15.0	13.2	12.0	10.8	9.8

^{1/} The difference between domestic production of lumber and domestic roundwood production (saw logs) in 1962 and later years largely reflects the growing practice of converting to pulp chips a portion of the lower-grade material in saw logs. The 1952 estimate was based on a special Forest Service survey of log and lumber production.

^{2/} Including equivalent log volumes of imported veneer and plywood.

^{3/} Including equivalent log volumes of imported pulp and paper and board, plus plant byproducts.

^{4/} Less than minimum reporting unit.

^{5/} Including equivalent log volumes of plant byproducts.

APPENDIX B
DEFINITION OF TERMS

APPENDIX B

DEFINITION OF TERMS

Allowable cut.--The volume of timber that may be cut during a given period under specified management plans for sustained production, such as those in effect on National Forests.

Commercial forest land.--Forest land which is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. Includes areas suitable for management to grow crops of industrial wood generally capable of producing in excess of 25 cubic feet per acre of annual growth. Includes both accessible and prospectively accessible areas and both operable and prospectively operable areas.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products; excludes so-called weed species, such as willow and dogwood.

Cull trees.--Live trees that do not contain at least one merchantable 12-foot saw log now or prospectively, because of defect, rot, or species (also see sound cull trees and rotten cull trees).

Diameter classes.--A classification of trees based on diameter of the tree outside bark, measured at breast height (4-1/2 feet above the ground). D.b.h. is the common abbreviation for "diameter at breast height." Two-inch diameter classes in which the even inch is the approximate midpoint are used. For example, the 6-inch class includes trees 5.0 to 6.9 inches d.b.h. inclusive.

Employment.--The number of workers reported under the appropriate SIC Codes by the Oregon Department of Employment. It includes only that employment covered by the State Unemployment Insurance Law.

Farm.--A place operated as a unit of 10 or more acres from which the sale of agricultural products totaled \$50 or more annually, or a place operated as a unit of less than 10 acres from which the sale of agricultural products totaled \$250 or more annually during the previous year.

Farmer-owned lands.--Lands owned by operators of farms.

Forest industry lands.--Lands owned by companies or individuals operating wood-using plants.

Forest land.--Land at least 10 percent stocked by forest trees of any size, or formerly having such tree cover and not currently developed for nonforest use. (Also see commercial forest land, noncommercial forest land, productive-reserved forest land, and unproductive forest land.) Includes chaparral areas in the West and afforested areas. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams, and clearings in forest areas are classed as forest if less than 120 feet in width.

Forest management.--The protection and management of forest lands for the production of timber and related products.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height, including both growing stock and cull trees.

Growing-stock trees.--Live sawtimber trees, poletimber trees, saplings and seedlings meeting specified standards of quality or vigor; excludes cull trees.

Growth.--See definitions for "net annual growth" and "ingrowth."

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

Harvesting.--The harvest and transportation of logs and related products from forests to local points of delivery.

Land area.--(a) Census definition: The area of dry land and land temporarily or partially covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area; (b) Forest Survey definition: Same as above except maximum width of streams, etc., is 120 feet and maximum size of lakes, etc., is 1 acre.

Miscellaneous private lands.--Privately owned lands other than forest industry or farmer-owned.

Mortality.--The volume of sound wood in live sawtimber and pole-timber trees dying from natural causes during a specified period.

National Forest land.--Federal lands which have been designated by Executive order or statute as National Forests or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones title III lands.

Net annual growth.--The annual change in volume of sound wood in live sawtimber and poletimber trees resulting from natural causes, i.e., increase in volume in absence of mortality and cutting, minus mortality, plus growth on mortality and growth on one-half the cut during a specified year.

Net volume.--The gross volume of a tree less deductions for rot, sweep, or other defects affecting use.

Nonstocked areas.--Commercial forest land less than 10 percent stocked with growing-stock trees.

Ownership.--The property owned by one owner, regardless of the number of parcels that it may consist of, in a specified area such as a State or the United States as a whole.

Plant residues.--Wood materials from primary manufacturing plants that are not used for some product.

Poletimber stands.--Stands at least 10 percent stocked with growing-stock trees, and with half or more of this stocking in sawtimber and/or poletimber trees, and with poletimber stocking exceeding that of sawtimber.

Poletimber trees.--Live trees 5.0 to 10.9 inches in diameter at breast height.

Productive-reserved forest land.--Productive public forest land withdrawn from timber utilization through statute or administrative regulation.

Projected demand.--The estimated quantity of a roundwood product, or products, that would be demanded at specified times in the future under explicit assumptions as to (1) the growth of population and national product, (2) trends in the use of materials, and (3) trends in the prices of timber products relative to substitute materials.

Projected employment.--The estimated volume of employment that would be associated with meeting projected demands for a timber product or products at specified times in the future under explicit assumptions as to (1) changes in productivity; i.e., output per employee, and (2) changes in secondary manufacturing activities.

Saplings.--Live trees of commercial species 1.0 inch to 5.0 inches in diameter at breast height and of good form and vigor.

Sawtimber stands.--Stands at least 10 percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or pole-timber trees and with sawtimber stocking at least equal to poletimber stocking.

Sawtimber trees.--Live trees containing at least one minimum saw log. Softwoods must be at least 9.0 inches in diameter at breast height except in California, Oregon, Washington, and coastal Alaska, where the minimum diameter is 11.0 inches. Hardwoods must be at least 11.0 inches in diameter in all States.

Softwoods.--Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stocking.--A measure of the degree to which area is occupied or utilized by trees of specified classes, including (1) all live trees, (2) growing-stock trees, and (3) desirable trees. Classification of forest land and forest types is based on stocking of all live trees. Stocking of growing-stock trees is used to determine stand size and age class. Area-condition classes are based on stocking of desirable trees.

Stocking standards.--The minimum number of well-spaced trees required to fully utilize the area by specified forest types and sites.

Timber cut from sawtimber.--The net board-foot volume of live sawtimber trees cut for forest products during a specified period, including both roundwood products and logging residues.

Timber products.--Roundwood products and byproducts of primary wood manufacturing plants. Includes saw logs, veneer logs and bolts, cooperage logs and bolts, pulpwood, fuelwood, piling, poles, posts, hewn ties, mine timbers, and other round, split, or hewn products.

Timber products industries.--Industries included in Major Group 24, Lumber and Wood Products, Except Furniture; and Major Group 26, Paper and Allied Products, described in the Standard Industrial Classification Manual. The major industries are:

Logging.--Logging camps and logging contractors primarily engaged in cutting timber and in producing rough, round primary forest or wood raw materials.

Sawmills and planing mills.--Establishments primarily engaged in sawing rough lumber and timber from logs and bolts, or resawing cants and flitches into lumber, including box lumber, and softwood cut stock; planing mills combined with sawmills; and separately operated planing mills which are engaged primarily in producing surfaced lumber and standard workings or patterns lumber.

Veneer and plywood plants.--Establishments primarily engaged in producing commercial veneer, either face or technical, and those primarily engaged in manufacturing commercial plywood, including nonwood backed or faced veneer and nonwood faced plywood, from veneer produced in the same establishment or from purchased veneer.

Paper and allied products.--Establishments primarily engaged in the manufacturing of pulps from wood and other cellulose fibers and rags; the manufacture of paper and paperboard; and the manufacture of paper and paperboard into converted products such as paper coated off the paper machine, paper bags, paper boxes, and envelopes.

Miscellaneous wood manufacturing.--Employment reported for several other SIC divisions within Major Group 24 were combined as miscellaneous wood manufacturing. The group includes hardwood dimension mills, shingle mills, millwork plants, prefabricated structures, wooden containers, and wood preserving. Industries in this group are either secondary manufacturers or they process a small amount of the total log harvest. They employ a relatively small proportion of the total number of workers.

Wood is consumed by firms in Major Group 25, Furniture and Fixtures, but these industries were not studied because the quantities of wood processed, often in combination with other materials, and number of workers employed in the Pacific Northwest are small.

Tree size classes.--A classification of growing-stock trees according to diameter at breast height outside bark, including sawtimber trees, poletimber trees, saplings and seedlings.

Value added by manufacture.--Adjusted value added is obtained by subtracting cost of materials, supplies and containers, fuel, purchased electric energy, and contract work from value of shipments for products manufactured, plus receipts for services rendered and other receipts such as the sale of scrap. It also includes (1) value added by merchandising operations (i.e., the difference between the sale value and cost of merchandise sold without further manufacture, processing, or assembly), plus (2) the net change in finished goods and work-in-process inventories between the beginning and end of the year (Bureau of Census 1958).

Volume of growing stock.--The cubic-foot volume of sound wood in the bole of noncull sawtimber and poletimber trees of commercial species from a 1-foot stump to a minimum 4.0-inch top outside bark or to the point where the central stem breaks into limbs.

Volume of sawtimber.--Net volume of the saw-log portion of live sawtimber trees in board feet.

Young-growth sawtimber stands.--Sawtimber stands in which 50 percent or more of the stand is in young-growth sawtimber trees.

Young-growth sawtimber trees.--Trees that have not passed the age of physiological maturity.

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